

## Propagation of *Geotrichum candidum* in Acid Brine<sup>1</sup>

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*Geotrichum candidum* completely neutralized the acid brine and reduced its biochemical oxygen demand (BOD) by 88%. Yield of dry mycelium was 62 g per 100 g of BOD utilized.

Acid brines generated in the manufacture of pickles, sauerkraut, and olives have extremely high biochemical oxygen demands (BOD), low pH values, and high NaCl contents and thus cannot be treated in conventional sewage systems (2, 4, 5). Yeasts have been reported to grow well in acid brines (3); acids were utilized and the BOD was reduced by as much as 87%. However, using centrifugation to separate the yeast cells from the fermentation medium is a very costly operation. *Geotrichum candidum*, a food fungus, has been well-known for its ability to convert a variety of substrates into a mycelium that can be readily recovered by simple filtration (6). The present study was undertaken to evaluate the capability of this fungus to utilize the acid brine generated in sauerkraut manufacture.

Acid brine used in this work was obtained from a commercial sauerkraut factory and contained the following, expressed as milligrams/liter: BOD, 24,000; total acid as lactic, 19,900; Kjeldahl nitrogen, 1,100; total phosphorus, 192; and NaCl, 26,500. The pH was 3.4. Experiments were carried out in 500-ml Erlenmeyer flasks containing 100 ml of acid brine incubated at 25 C on a rotary shaker at a speed of 200 rpm. All flasks were inoculated with 48-h-old cultures at a 1% level (vol/vol). The methods used to determine the 5-day BOD, total acid as lactic, Kjeldahl nitrogen, total phosphorus, and NaCl have been described (2). Mycelial weight was determined by filtering, washing with distilled water, and drying at 105 C overnight. Protein, fat, ash, fiber, and moisture were determined by methods of the Association of Official Agricultural Chemists (1). All experiments were conducted in duplicate, and the reported data are the average values.

Approximately 1 day elapsed before exponential growth was established (Fig. 1). The myce-

lial growth and biochemical changes increased rapidly between 1 and 3 days and reached their plateau on the 4th day. The BOD was reduced from an initial value of 24,000 mg/liter to 3,000 mg/liter, and the pH was raised from 3.4 to slightly alkaline reaction. No residual total acid as lactic was found. This may have economic significance since acid waste effluents generally require neutralization before they can be effectively treated in secondary waste treatment systems such as activated sludge and trickling filter. Mycelial yield was approximately 13 g per liter of acid brine. Based on the BOD utilized, yield of dry mycelium was as much as 62%. The mycelium could be collected easily by filtration, and the filtrates were clear. This is considered to be a definite advantage in the treatment of waste water by fungi. Because of its high protein content (Table 1), the mycelium may be used as a feed supplement.

Extending the fermentation beyond 4 days did not significantly lower the BOD or increase the mycelial growth. This may be explained by the: (i) presence of compounds not readily

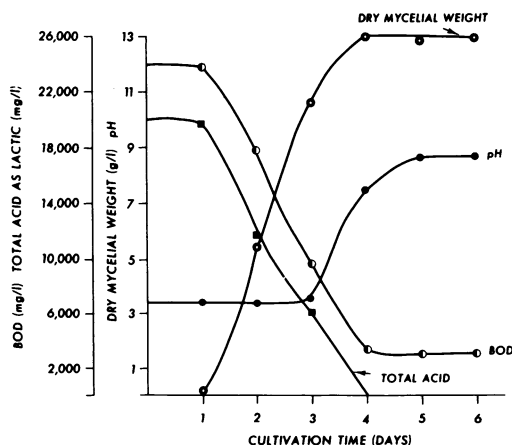


FIG. 1. Growth of *G. candidum* in acid brine.

<sup>1</sup> New York State Agricultural Experiment Station Journal paper no. 1975.

TABLE 1. *Chemical composition of G. candidum grown in acid brine*

Composition	%
Protein .....	39.30
Fat .....	0.94
Carbohydrates (by difference) .....	42.26
Ash .....	5.30
Fiber .....	9.30
Moisture .....	2.90

utilized by the fungus, (ii) exhaustion of essential nutrients, or (iii) accumulation of metabolic inhibitors. All of these possibilities are being studied.

We are encouraged by the marked reduction in the BOD and the high mycelial yield and, therefore, feel that propagating *G. candidum* in acid brine may have economic value in waste disposal and in the production of single-cell protein.

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